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09/887,697	11/01/2001	Shih-Fu Lee	146712013800	3474

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EXAMINER

PROCTOR, JASON SCOTT

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 01/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	09/887,697		LEE ET AL.	
	Examiner		Art Unit	
	Jason Proctor		2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-16 and 18-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-16 and 18-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10/17/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Requirement for Information

The Examiner thanks Applicants for responding to the previous Requirement for Information under 37 CFR 1.105. The associated Information Disclosure Statement has been considered by the Examiner.

Claim Objections

1. Claims 11-15 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 11 recites a single step of “providing a model for glide avalanche (GA)” and defines an equation for GA. However, aside from “providing a model for glide avalanche,” neither claim 5 nor 11 recite any use, application, or involvement with “a model for glide avalanche.” Therefore the limitations of claim 11 do not further limit claim 5 in any identifiable manner.

Claim 13 is objected to for similar reasons.

Claims 12 and 14-15 are objected to for similar rationale.

Claim Rejections - 35 USC § 101

35 U.S.C. § 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 5-16 and 18-20 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter.

Independent claim 5 recites an abstract mathematical algorithm that does not produce a useful, concrete, and tangible result as required by MPEP 2106 to establish a statutory method. In order to define a statutory method, the claim should recite a step of practical application for the “head-media spacing modulation spectrum,” such as referring to the disclosed application of providing a means to monitor results of substrate processing (specification, paragraph 0035).

Independent claim 16 recites a method of “determining head-media spacing (HMS) modulation model” which is a mathematical abstraction. Indeed the result of the method is a step of determining numerical or mathematical data. Similar to claim 5, claim 16 fails to produce a useful, concrete, and tangible result. In order to define a statutory method, the claim should result some practical application of the “simulated head-media spacing modulation” that results in a useful, concrete, and tangible result.

Independent claim 18 recites an “apparatus” defined in “means for” language. In light of the disclosure, claim 18 refers to a software “apparatus” and thus is nonstatutory for defining software *per se*.

Regarding the rationale for all of these rejections under 35 U.S.C. § 101, please see MPEP 2106, in particular MPEP 2106(II)(A) regarding a useful, concrete, and tangible result.

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Claims rejected but not specifically mentioned stand rejected by virtue of their dependence.

To expedite a complete examination of the instant application the claims rejected under 35 U.S.C. § 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. § 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 5-15 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 5 recites the limitation “multiplying the topography function and the air bearing transfer function to provide the head-media spacing modulation spectrum” which is not adequately described in the specification. Further, Applicants’ response to the previous Office Action has defined “spectrum” to mean “a spread in values of the head-media spacing modulation” which illustrates the lack of support for this limitation. Careful consideration of the

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disclosure fails to reveal an act of “multiplying the topography function and the air bearing transfer function” that results in “a spread in values of the head-media spacing modulation”.

To illustrate, the specification (page 3, paragraph 0010) teaches that:

The topography function and the air bearing transfer function are convoluted to provide the head-media spacing modulation spectrum.

The Examiner is unaware of the meaning of the term “convoluted” when used as a verb. Presumably Applicants’ mean the term “convolved,” but do Applicants’ define “convolved” as synonymous with “multiplied?”

The specification (page 8, paragraph 0037) teaches that:

At step 35, the air bearing transfer function from step 29, with its spectral density, is convolved with the power spectral density function from step 34. This produces an HMS modulation spectrum.

Does this portion of the disclosure teach an alternative method of producing the HMS modulation spectrum? Do Applicants define “convolve” as synonymous with “multiplying?” Do Applicants define the “power spectral density function” as synonymous with “topography function”?

The Examiner respectfully requests that Applicants’ identify the specific portions of the specification that support the limitation at issue as well as clearly identify which terms used in the application are to be interpreted as synonymous.

Claims rejected but not specifically mentioned stand rejected by virtue of their dependence.

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The previous rejection of claim 1 is moot, as claim 1 has been cancelled.

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4. Claims 5-15 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 recites the step of “simulating a head passing in near proximity to a simulated disc media surface to generate an air bearing transfer function for a spectral density” but does not recite the relationship between such a simulation and the generation of an air bearing transfer function. There are countless methods of simulating a head passing in near proximity to a simulated disc media surface but it is entirely unclear how an air bearing transfer function is the outcome of such a simulation.

In response, Applicants’ argue primarily that:

[T]he subject matter that Applicants regards as their invention within the scope of claim 5 is any relationship between such a simulation and the generation of an air bearing transfer function. The fact that the claim is open to any such relationship does not make the claim indefinite under 35 USC 112, second paragraph. By the Examiner’s standard for “indefiniteness,” any claim that discloses a genus should be indefinite because the genus could include countless species within the scope of the genus. Clearly, the Examiner’s standard for “indefiniteness” is not the legal standard.

The Examiner respectfully traverses this argument as follows.

This rejection of claim 5 is not based on the breadth of the claim, which is addressed by Applicants’ argument. This rejection of claim 5 is based on the claim language, which explicitly recites a step of “simulating a head passing in near proximity to a simulated disc media surface” with the objective “to generate an air bearing transfer function for a spectral density”. These two concepts lack a logical nexus. A step of “simulating” produces a “simulation” or “simulation data,” neither of which is a “function” using any ordinary definition. A “function” is an abstract concept that takes an input and produces a corresponding output, such as the mathematical

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function $y = 1+x$. Simulation data is not a function. The limitation is indefinite not because of its breadth, but because there is no logical nexus between “simulating” and the objective “to generate an air bearing transfer function for a spectral density”. Note that claim 8 appears to recite the required logical nexus between “simulating” and “generating [a] function.”

Applicants’ arguments have been fully considered but have been found unpersuasive.

Claim 5 recites a step of “multiplying the topography function and the air bearing transfer function to provide the head-media spacing modulation spectrum.” Multiplying a function by a function results in a function, not a spectrum. It is unknown how the recited step produces a spectrum.

In response, Applicants’ argue primarily that:

The term “spectrum” simply means a spread in values of the head-media spacing modulation. There is nothing indefinite about the term “spectrum.” Applicants have the right to be their own lexicographer. The Examiner’s position that multiplying a function by a function results in a function might be correct in some cases, but that does not mean that the term “spectrum” is indefinite.

The Examiner respectfully traverses this argument as follows.

This rejection of claim 5 of claim 5 is not based on the meaning of the term “spectrum.” This rejection is based on the claim language, which explicitly recites a step of multiplying two functions to produce a spectrum. Applicants’ clarification that the term “spectrum” means “a spread in values of the head-media spacing modulation” is helpful in identifying that a “spectrum” is mathematical or numerical data. As explained above, a function is not data, but an abstract concept that takes an input and produces a corresponding output. While it is well known to multiply mathematic functions by one another, the Examiner is unaware of any such method wherein the result is a “spectrum.” While Applicants indeed have the right to be their own

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lexicographer, the meaning of the limitation “multiplying the topography function and the air bearing transfer function to provide the head-media spacing modulation spectrum” remains indefinite.

Applicants’ arguments have been fully considered but have been found unpersuasive.

The previous rejection of claim 6 has been withdrawn in light of Applicants’ remarks. The limitation of “summing the head-media spacing modulation spectrum” is interpreted according to Applicants’ definition of “spectrum,” meaning “a spread in values.”

5. Claim 7 recites the limitation "the generating of the power spectral density function" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. Claim 7 depends from claim 5, which includes a limitation concluding “to generate an air bearing transfer function for spectral density.” Do Applicants’ define “power spectral density function” and “air bearing transfer function for spectral density” as synonymous? Clarification is required.

6. Claim 10 recites a step of “correlating results from the square-root-summing” which renders the claim indefinite. It is unknown to what the results from the square-root-summing are to be correlated. In the alternative, it is unknown what is meant by “correlating results” to nothing. The Examiner respectfully requests identification of the portions of the specification that describe this step. The specification (page 4, paragraph 0011) appears to contain a circular or similarly ambiguous description of this step.

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The previous rejections of claims 11, 13, and 14 have been withdrawn in light of Applicants' remarks. The previous rejection of claim 17 is moot, as claim 17 has been canceled.

Claims rejected but not specifically mentioned stand rejected by virtue of their dependence.

Prior Art Rejections

The previous rejections under 35 U.S.C. § 103 have been withdrawn in light of Applicants' arguments, which have been considered and found persuasive.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 5-16 and 18-20 are rejected under 35 U.S.C. § 102(a) as being anticipated by “The dynamic coupling of the slider to the disk surface and its relevance to take-off height” by Gonzalez et al., hereafter referred to as Gonzalez.

It is noted that Gonzalez was published in July 2001 but was presented on January 7-11, 2001 as noted on the citation provided with the reference.

Regarding claim 5, Gonzalez discloses a method of determining a portion of a head-media spacing modulation spectrum of a portion of an actual disk media surface [*“we calculate the frequency response of glide sliders to disk inputs of various wavelengths, using an air-bearing solver.”* (abstract); *“From the simulation, the ratio of clearance modulation amplitude to the disk waviness amplitude is shown in Fig. 4...”* (page 2, right column)] comprising:

Simulating a head passing in near proximity to a simulated disk media surface [*“The response of the slider was simulated for flying at ~6.5 nm on a disk with waviness of 1 nm amplitude and wavelengths from 0.1 to 7 mm with a skew of 45° to the direction of motion of the disk.”* (page 2, right column)];

Generating a topography function for the actual disc media surface (*disk roughness parameter*) [*“The roughness statistic that best estimates the highest peaks, the roughness peak mean R_{pm} , shows the best correlation with the measured take-off height data.”* (page 2, left column)]; and

Combining the topography function and air bearing transfer function to provide the head-media spacing modulation spectrum [*“The response of the slider was simulated for flying at ~6.5 nm on a disk with waviness of 1 nm amplitude and wavelengths from 0.1 to 7 mm with a skew of 45° to the direction of motion of the disk.”* (page 2, right column)].

Regarding claim 6, Gonzalez discloses providing a head-media spacing waviness value for the disk media surface [*“The FFT of the disk roughness profiles from the 13 cells was filtered... and transformed back to obtain the filtered “effective” disk roughness.”* (page 2, right column)].

Regarding claim 7, Gonzalez discloses sampling a portion of an actual disk media surface [*“Measurements of the disk roughness were made using a Tencor (EX) stylus profilometer.”* (page 2, left column)], translating the actual disk topography to wavelengths and averaging the sampled wavelengths to provide a sampled topography spectrum [*“Data from the Tencor and Wyko was analyzed using programs written in Matlab to extract roughness statistics.”* (page 2, left column); *“The response of the slider was simulated for flying at ~6.5 nm on a disk with waviness of 1 nm amplitude and wavelengths from 0.1 to 7 mm with a skew of 45° to the direction of motion of the disk.”* (page 2, right column)].

Regarding claim 8, Gonzalez discloses the claimed steps of simulating (page 2, left column – page 3, left column, “III. Results”).

Regarding claim 9, Gonzalez discloses providing a group of substrates [*“Disk substrates (13 cells) with various polishing conditions...”* (page 2, left column)] and determining roughness and waviness for each substrate [*“Data from the Tencor and Wyko was analyzed using programs written in Matlab to extract roughness statistics.”* (page 2, left column); [*“The response of the slider was simulated for flying at ~6.5 nm on a disk with waviness of 1 nm amplitude and wavelengths from 0.1 to 7 mm with a skew of 45° to the direction of motion of the disk.”* (page 2, right column)]].

Regarding claim 10, Gonzalez discloses correlating the results [*“This correlation has a 95% confidence interval...”*] (page 2, right column – page 3, left column).

Regarding claims 11-15, these claims recite limitations that do not further limit the claims from which they depend. The method of claims 11-15 are therefore identical to the method of claim 5, from which each of claims 11-15 ultimately depend. Claims 11-15 are therefore rejected for the same rationale given above for claim 5.

Regarding claim 16, Gonzalez discloses a method of determining a portion of a head-media spacing modulation model [*“we calculate the frequency response of glide sliders to disk inputs of various wavelengths, using an air-bearing solver.”*] (abstract); [*“From the simulation, the ratio of clearance modulation amplitude to the disk waviness amplitude is shown in Fig. 4...”*] (page 2, right column)] comprising:

Providing a disk topography having a wavelength [*“This code allows input of ... the waviness of the disk.”*] (page 2, right column); [*“The response of the slider was simulated for flying at ~6.5 nm on a disk with waviness of 1 nm amplitude and wavelengths from 0.1 to 7 mm with a skew of 45° to the direction of motion of the disk.”*] (page 2, right column)];

Selecting a head to model [*“the dynamic modeling of the low flying 62% slider used in this experiment...”*] (page 2, right column)];

Providing air bearing code for the head selected [*“The dynamic modeling of the low flying 62% slider used in this experiment was done using the CML dynamic air-bearing code [7].”*] (page 2, right column)];

Simulating the head passing over the disk topography with the air bearing code [*"The response of the slider was simulated for flying at ~6.5 nm on a disk with waviness of 1 nm amplitude and wavelengths from 0.1 to 7 mm with a skew of 45° to the direction of motion of the disk."* (page 2, right column)]; and

Determining simulated head-media spacing modulating [Fig. 4; *"From the simulation the ratio of clearance modulation amplitude to the disk waviness amplitude is shown in Fig. 4..."* (page 2, right column)].

Claims 18-20 recite an apparatus corresponding to the limitations of claims 5 and 6 and are rejected for the same rationale given above regarding claims 5 and 6.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

8. Claim 16 is rejected under 35 U.S.C. § 103(a) as being unpatentable over “Some Critical Tribological Issues in Contact and Near-Contact Recording” by D.B. Bogy, H.M. Stanley, M. Donovan, and E. Cha (1993) hereafter referred to as Bogy.

Bogy discloses a method of determining a head-media spacing modulation model (*simulation*) (section III, “Numerical Simulation of Spacing Variation and Asperity Impact Response”, pages 233-234) comprising:

Providing a simulated disc topography having a wavelength [*“The results are calculated using the general purpose numerical simulation program for the head-disk assembly (HDA) dynamics... This program incorporates the suspension, slider, air bearing and disk.” “[T]his is the first attempt to simulate unsteady spacing using the actual track topography”* (page 233, left column); *“the runout amplitude is only about 2 μ m, and it is essentially one wavelength for the entire track.”* (page 233, right column)];

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Selecting a head to model [*"We assume that the slider's rails are smooth. Spacing of 4mm slider and a 70% slider are calculated."* (page 233, left column); et cetera];

Providing air bearing code for the head selected [inherent in simulations such as, *"This program incorporates the suspension, slider, air bearing and disk,"* (page 233, left column)];
and

Simulating the head passing over the disc topography with the air bearing code (cited above).

Bogy teaches performing the simulation for an arbitrarily chosen wavelength [*"Both sliders are at 37mm from the center of the disk that is rotating at 3600 rpm."* (page 233, left column)].

It would have been obvious to a person of ordinary skill in the art to repeat the method disclosed by Bogy with a plurality of wavelengths, each defined by a combination of slider position and rate of disk rotation, because that person would immediately recognize that actual disk drives in normal use operate at a wide range of such values. Therefore the simulations would have greater fidelity and the simulation results would be more reliable if those results more closely reflected the normal use of a disk drive. This modification could be achieved by defining different parameters in the simulation for slider position and rate of disk rotation.

Conclusion

Because new grounds of rejection have been entered, this rejection is NON-FINAL to permit Applicants an appropriate opportunity to respond to those rejections.

Art considered pertinent by the examiner but not applied has been cited on form PTO-892.

US Patent 6,105,421 discloses a glide head apparatus for testing surface characteristics of a disc using a controllable glide head apparatus (abstract).

US Patent 6,785,081 discloses a fly height detector apparatus and a numerical model describing a functional interrelationship between the fly height and the read/write head frequency (abstract).

“Numerical Simulations of Dynamic Spacing And Asperity Contact of a Shaped Rail Slider” by Ellis Cha and David B. Bogy discloses a numerical simulation of fly height (*dynamic spacing*) composed of low frequency and high frequency components due to waviness and roughness of the track topography (abstract).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Proctor whose telephone number is (571) 272-3713. The examiner can normally be reached on 8:30 am-4:30 pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached at (571) 272-3749. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

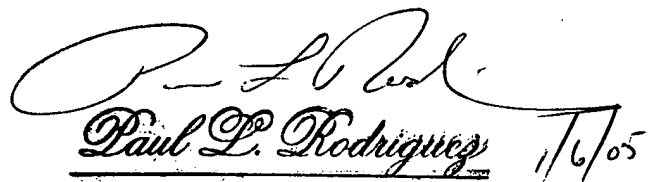
Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR)

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system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jason Proctor
Examiner
Art Unit 2123

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Paul L. Rodriguez 1/6/05
Primary Examiner
Art Unit 2125